


An educational behaviour lifestyle-based program to prevent risk factors of type 2 diabetes among older adults

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ABSTRACT

Objective. To test the effectiveness of a 12-wk educational-based program on glycaemic control, body composition, functional capacity and health related quality of life among type 2 diabetes mellitus older patients. **Methods.** Twenty-three non-insulin dependent T2DM patients were include in this cuasi-experimental study. A pre-post study was performance. Outcomes including fasting blood glucose, body composition, functional capacity and health related quality of life were assessed at baseline and after 12-wk intervention. **Results.** After intervention, there was a reduction of fasting blood glucose, with an effect size of 0.50. Similarly, after intervention great values were found in BMI ($p<0,05$) and functional capacity (T6MWT and handgrip test). Health related quality of life was improved (physical functioning dimension with a statically significance <0.05). **Conclusion.** A 12-wk educational-based program could improve and management the disease, improving glycaemic profile, functional capacity, body composition and psychosocial status among T2DM patients. **Key words:** T2DM, PREVENTION, LIFESTYLE, HEALTH-RELATED QUALITY OF LIFE (HRQOL); FUNCTIONAL CAPACITY.

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INTRODUCTION

Aging is a multifactorial process resulting in damage of molecules, cells, and tissues, leading to a reduce the efficacy of physiological functions with different pathological consequences (del Pozo-Cruz, et al., 2014). Type 2 diabetes mellitus (T2DM) is a metabolic disorder characterized by hyperglycaemia and insufficient secretion or action of endogenous insulin (ADA, 2014; Leal et al., 2017). Moreover, patients with type 2 diabetes are characterized by high adiposity and reduced fitness, predictors of the health related quality of life (Alfonso-Rosa-et al., 2012; Hernández et al., 2016). Like-wise, T2DM is an independent risk factor for vascular diseases and also is frequently associate with other cardiovascular diseases (Koelmeyer et al., 2016; Alfonso-Rosa et al., 2013).

Along with nutrition, exercise has long been recognized as a part of the non pharmacological treatmen and management of type 2 diabetes. Although there no definitive conclusions, results from diferents meta-analysis, suggest that different types of exercise (i.e. arecobic exercise, resistance trining or combined training) reduce fasting blood glucose when compared with standard care and treatment. In line with this, there is a substantial evidence from multiple randomised controlled trials indicating that T2DM can be improved or at least controlled by lifestyle changes (Troughton et al., 2016). Differents lifestyle modification programs have showed an acceptable effectivity ratio. Previous studies have showed to be effectives in the management of risk factors associated to the T2DM (Wu et al., 2017). However, many of this programs are based on supervised exercise and physical activity, and also a few programs included a plus of conseuling and educational tasks in their programs (Alfonso-Rosa, 2013). To the best of our knowledge, none of this studies have assessed the effects of an educational behavioral lifestyle program on T2DM. Therefore, the main aim of this study was to assess the effectiveness of apply a 12- week educational program to reduce the risks factors associated with a T2DM in older people.

MATERIALS AND METHODS

Study design and participants

A cuasi-experimental study (pre-post intervention) was conducted. The study was approved by the research ethics committee of the university and conducted according to the declaration of the Helsinki, as revised in Edinburgh, 2008. After public information, all participants signed an informed consent form prior to participation in the study. All participants, were recruited from the same Diabetes Association. Criteria inclusion included: age as least 60 years old and were community-dwelling people from the zone where the study was performance. Potential participant was excluded if they had a pacemaker, knee injury, hip or knee prosthesis, hernia, cardiac or other systemic disease, not well balance with medical treatment, diabetic neuropathy or severe vertigo. Out of 55 eligible participants, 34 showed interest and finally 23 fulfilled the inclusion/exclusion criteria and were included in the study.

Procedures and Experimental protocol

Participants had access to the usual care (consisting on outpatient visit for the control of the diabetes-related parameters) and were asked do not change their nutritional status unless was advice by the protocol of the study. Intervention consisted in a 12-week behavioural and educational program based on physical activity advices.

Once a week during 12-weeks (120 minutes per session), participants were asked to meet in the association. The protocol involved reviewing previous research on barriers to physical activity and identify the key

emotions, beliefs, control factors, skills, etc. Fasting blood glucose were assessed in each session and participants were educated and asked to increase walking-based physical activity.

Outcomes measures

Socio-demographic variables (i.e. age, gender) as well as clinical predictor variables were recorded. Weight, height, and waist to hip circumference were measured to calculate body-mass index (BMI; Kg/m²) and waist to hip ratio. Outcome measured were assessed at baseline and after the 12-wk study period.

Fasting blood glucose and functional capacity

Fasting blood glucose (mg/dl) was assessed each time for 12 weeks. To assess functional capacity, a test battery consisting of three assessments was used. Motor agility and mobility were assessed by the Time Up and Go test. The participant had to stand up from a chair, walk 3 m to and around a cone, and return to the chair in the shortest time possible. The best time of two trials was recorded. To evaluate the cardiovascular status, the Six Minute Walking Test (6MWT) was conducted. Participants were instructed to walk as far as possible within run. The maximum distance (m) walked was recorded as the score of the test.

Muscle performance was assessed using the 30-s Chair Sit to stand test. Participants were instructed to perform the test where initial position and final position was the same (sit). The number of times within 30 s that the participant could raise to a full stand from a seated position as fast as possible. The peak force was recorded using a Kistler force platform, type 9281A (Kistler Instruments AG, Winterthur, Switzerland). The peak during the performance 30 CSTS test was then recorded.

Health-related quality of life

The SF36 health survey was used to assess the health-related quality of life. The SF36 include 36 dimensions (physical functioning, social functioning, role limitations-physical and social problems-, pain, mental health, vitality and general health perception).

Statistical analysis

Analysis was performed using SPSS version 17.0 (SPSS Inc, Chicago, IL, USA). The significance level was set at $p < 0.05$ for all analysis. The distribution of the data was determined by the Kolmogorov-Smirnov test. After that, paired t-test was performed to test the difference between baseline and postintervention values. In addition, Effect size was calculated as the difference between means divided by the pooled standard deviation. Cohen's coefficient was used to assess the possible change in the variable.

RESULTS

23 participants aged plus 60 were included in the study. The baseline socio-demographic, clinical and body composition variables were compared (table 1). Statistically differences were found between pre and post tests on BMI and weight variables. Non-statistically differences were found for the rest of variables compared. Effect size was over 0.3 in all cases.

Fasting blood glucose

No statistically differences between baseline values and post intervention values were observed for fasting blood glucose. Although no statistically differences were found, participants in the post intervention moment exhibited greater (lower) values of fasting blood glucose with an effect-size of 0.50.

Table 1. Sociodemographic and anthropometrics characteristics of the participants in the study ($n = 23$).

Variable	Pre-test	Post-test	p	Effect-size
Sex (%female)	47.83	47.83	-	-
Age (years)	63.96	63.96	-	-
Height (cm)	163.65 (11.44)	163.33 (11.26)	-	-
Weight (Kg)	77.14 (21.94)	75.12 (19.78)	0.08*	0.38
BMI (kg/m ²)	28.63 (6.44)	27.96 (6.24)	0.035*	0.45
% Body fat	36.43 (7.27)	35.85 (7.95)	0,140*	0.33
WHR	0.98	0.95	0.089*	0.38

Values are mean (SD) unless otherwise indicated; BMI, body mass index; WHR, waist to hip ratio; p , p value from paired- t test.

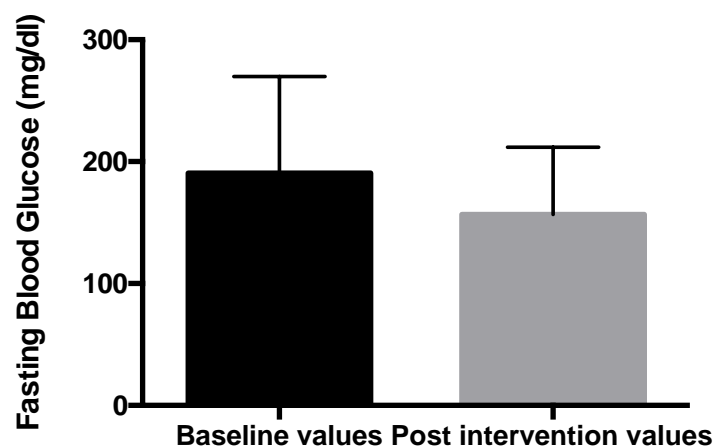


Figure 1. Effects of 12-wk educational program on fasting blood glucose. The graph shows fasting blood glucose levels (mg/dl) with baselines values of 190,63(79,31) and 166,00 (54,40) for post intervention values in older adults with T2DM ($n = 23$).

Functional Capacity

Table 2 shows the effects of 12 weeks of behavioural education program on the fitness levels of the participants in the study. Statistically different were found the baseline and post intervention values on the

handgrip (right and left side) variables ($p < 0.05$) and in the 30-s CSTS peak power assessed with a force platform. No statically different were found in the rest of variables. However, we did detect a moderate effect size for the six-minute walking test (0.19).

Table 2. Effects of 12-wk educational program on functional capacity in older adults with T2DM (n = 23).

Variable	Pre-test	Post-test	p	Effect-size
HANDGRIPleft (kgs*m-2)	20.18 (9.09)	22.47(8.42)	0.011*	0.12
HANDGRIPright (kgs*m-2)	22.54 (10.42)	24.65 (9.02)	0.021*	0.10
30-s CSTS (number of times)	9.87 (1.94)	9.35 (1.41)	0.263	0.14
30-s CSTS* (N)	816.0 (235.66)	926.64 (253.33)	0.000*	0.22
TUG (s)	7.49 (2.07)	6.93 (1.57)	0.106	0.15
6MWT (m)	374.99 (81.04)	412.00 (104.43)	0.104	0.19

Values are mean (SD) unless otherwise indicated; 30-s CTS: 30 seconds Chair Sit to Stand test; 30-s CSTS*: 30-s CSTS peak power y el encoder lineal. TUG: Timed Up and Go Test; 6MWT: Six Minutes Walking Test.

Health related quality of life

Scores from different dimensions of the SF36 questionnaire, show statically difference between baseline and post intervention group on the physical functioning dimension ($p < 0.05$). Although no statically differences were observed in the rest of dimensions, in general upper scores were found for rol limitations and mental health dimensions while lower scores were exhibited for pain and vitality dimensions. Effect size show and over score 0.19 for the rol limitation dimension (table 3).

Table 3. Effects of 12-wk educational program on health-related quality of life in older adults with T2DM ($n = 23$).

Dimensions SF36	Pre-test	Post-test	<i>p</i>	Effect-size
Physical functioning	68.69 (22.52)	74.08 (24.09)	0.028**	0.11
Social functioning	82.07 (25.23)	80.87 (24.65)	0.500	0.02
Rol limitations (physical problems)	61.96 (44.51)	69.51 (38.39)	0.380	0.09
Rol limitations (social problems)	68.12 (46.58)	84.27 (34.26)	0.475	0.19
Pain	60.35 (28.21)	56.19 (26.95)	0.314	0.07
Mental health	65.74 (25.43)	67.31 (25.75)	0.102	0.03
Vitality	58.69 (28.05)	57.86 (24.40)	0.857	0.04
General health perception	56.52 (20.19)	55.14 (28.53)	0.852	0.04

Values are mean (SD) unless otherwise indicated SF36 (Short Form 36 Health Survey).

DISCUSSION

A cuasi-experimental design was used to evaluate the effectiveness of a 12-wk educational behaviour lifestyle-based intervention added to standard care among T2DM older adults patients on fasting blood glucose, functional capacity and health related quality of life. The main findings were that patients of the study trends reduce the fasting blood glucose after the application of the program. Moreover, functional capacity was also improve following the intervention in these participants. Thus, the results of our study are promising and of value to health care practitioners who treat T2DM patients.

Using exercise and physical activity as a health care, previous literature on T2DM population and sedentary people have reported improvements in different outcomes (Yu et al., 2017). Other authors tested how WBV exercise in a high frequencies reported improvements in fasting blood glucose as well as our results (Alfonso-Rosa et al., 2014). Therefore we aimed the educational conseuling physical activity-based as therapy.

Although HbA1c is considered the optimal way to assess long-term glycemic control, with HbA1c values of <7.0% accepted as representing good glucose control (del Pozo-Cruz et al., 2014), fasting blood glucose may be considered a good marker to control and management the T2DM (Cabrera et al., 2004). Our results showed an decrease of fasting blood glucose between baseline values and postintervention values. Along with this results, previous literatur have show how promotion health programs could reduce the same parameter (Balk et al., 2015).

Cardiovascular disease is related with Weight and BMI in older adults and is the leading cause of death among individuals with T2DM (Dickerson et al., 2011), and therefore the management of this risk factors for the disease is a priority among researchers and health care practitioners. In our study, statistically significant were found, where lower values were showed after intervention. Although others authors have reported similar results after health promotion program, no previous studies have applied only educational programs according with us. However, further study is needed to make direct comparisons and draw definitive conclusions on this fact.

As expected from the previous literature and reviews of exercise training, our patients experienced an improvement in functional lower limb and upper strength. Moreover, T2DM patients included in our study reported an improvement on aerobic capacity assessed by T6MWT. It has been suggested that T2DM may have control problems associated with peripheral sensory impairment and a decrease in their functional capacity (Sañudo Corrales et al., 2014). There is evidence that exercise is effective for lowering the risk and can improve the balance, gait and in general functional capacity, include aerobic fitness (Alvarez- Barbosa et al., 2014).

The results presented from the current study need to be considered in the context of its limitations. The fact that we did not use a population-based approach could limit the generalization of the results. Moreover, the use of a quasi-experimental design to perform this study could limit the understanding of the results. Despite the effectiveness shown in the current study, we have not determined the dose-response relationship for educational program and therefore further studies are needed to provide an optimal intervention for T2DM patients. Finally analysis of cost-effectiveness is warranted to enhance the decision-making process of policy makers on the implementation of this type of intervention.

CONCLUSIONS

The application of a 12-wk educational behaviour lifestyle program to prevent risk factors in T2DM setting is feasible and effective to reduce risk factors associated with type 2 diabetes in older community-dwelling people, improve performance in activities of daily living and increase health related quality of life in older people with T2DM. Although results are clear, more research is necessary with an RCT design in order to confirm these results. Moreover, our results could help to operate as a model for T2DM management in this population.

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